PATENT
Docket No. 146712002000

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the application of:

Chung-Hee CHANG et al.

Serial No.: 09/873,314

Filing Date: June 5, 2001

For: MAGNETIC ANISOTROPY OF SOFT-UNDERLAYER INDUCED BY SEEDLAYER

Examiner: Holly C. Rickman

Group Art Unit: 1773

DECLARATION UNDER 37 CFR 1.131

Commissioner for Patents
Washington, D.C. 20231

Sir:

Chung-Hee Chang, declares under penalty of perjury under the laws of the United States of America as follows:

(1) I, Chung-Hee Chang, have been working for Seagate Technology for about 5 years since November of 1997. Prior to that, I worked at Data Storage Systems Center in Carnegie Mellon University. I received my Ph.D. degree in Physics from Arizona State University, and my BS and MS degrees from Pusan National University in Korea. My expertise is in design, fabrication and characterization of thin film materials with emphasis on the use of them as magnetic and magneto-optical recording media, and optical elements.

(2) I am familiar with the subject matter and claims of the present application. I am also familiar with the subject matter of U.S. Patent 6,395,413 B1 (Ando) and U.S. Patent 5,226,966 (Mallary) cited by the Examiner in the Action of October 23, 2002.

(3) I reviewed the Examiner's rejection and it seems that the Examiner is assuming the following: (a) The NiP layer that lies below the permalloy soft magnetic layer in the perpendicular magnetic recording disk of Mallary induces radial anisotropy in the permalloy soft magnetic layer. (b) The Co-Sm layer that lies below the $Co_{91}Zr_5Nb_4$ soft magnetic layer in the perpendicular magnetic recording disk of Ando induces radial anisotropy in the Co-Zr soft magnetic layer. These assumptions are incorrect in light of the evidence provided below.

(4) I found my own data that shows that $Ni_{75}Fe_{25}$ (permalloy) is circumferentially anisotropic, *not* radially anisotropic, when deposited on Al/NiP substrates. Fig. 1 below shows the hysteresis loops for 200 nm thick $Ni_{75}Fe_{25}$ deposited directly on Al/NiP substrate. It shows that permalloy is circumferentially anisotropic when deposited on Al/NiP substrates. Clearly, Fig. 1 shows that a NiP layer does *not* necessarily induce radial anisotropy in the permalloy layer.

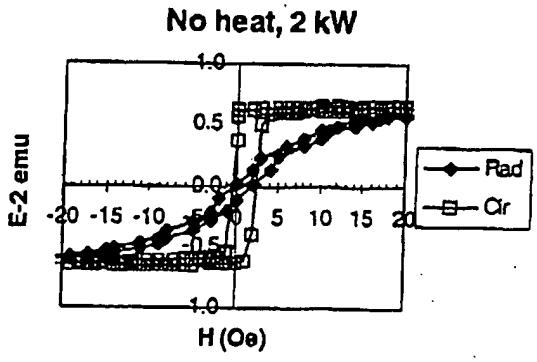

Fig. 1: Hysteresis loops of 200 nm thick $Ni_{75}Fe_{25}$ deposited on Al/NiP substrate.

(5) I also found that a $Co_{91}Zr_5Nb_4$ soft underlayer *without* even a hard magnetic pinning layer such as the Co-Sm layer of Ando is anisotropic *on its own*. Here I am showing my own data for a 200 nm thick $Co_{91}Zr_5Nb_4$ soft underlayer films sputtered under various conditions in the presence of magnetron field on a substrate *without* a Co-Sm layer underneath the $Co_{91}Zr_5Nb_4$ soft underlayer films. One can see from Figure 2 that $Co_{91}Zr_5Nb_4$ becomes radially anisotropic under a wide range of deposition conditions (substrate temperature, sputtering pressure, and deposition rate). For the samples shown in Figure 2, the substrate temperature was varied between ambient (no heat) to about 300°C (with heat), the Ar gas flow of 5-15 sccm corresponds to Ar pressure of 2-6 mtorr, and the deposition power of 1-4 kW corresponds to a deposition rate of 3.6-14.4 nm/s. The numbers in the unit of Oe shown in each graph in Figure 2 are coercivities in the radial and circumferential directions. Note that Ando discloses that the thickness of the $Co_{91}Zr_5Nb_4$ soft underlayer is 600 nm while my data in Figure 2 is for a $Co_{91}Zr_5Nb_4$ soft underlayer thickness of 200 nm. I have shown that a 200 nm thick $Co_{91}Zr_5Nb_4$ soft underlayer has radial anisotropy on its own without the anisotropy being induced by a Co-Sm layer below the $Co_{91}Zr_5Nb_4$ soft underlayer. A person of ordinary skill in this art would recognize that similarly a $Co_{91}Zr_5Nb_4$ soft underlayer of thickness 600 nm would have radial anisotropy on its own without the anisotropy being induced by a Co-Sm layer below the $Co_{91}Zr_5Nb_4$ soft underlayer.

I declare under penalty of perjury under the laws of the United States that the foregoing is true and correct. Executed at Fremont, California, United Stated of America, on this 23rd day of January 2003.

Chung-Hee Chang

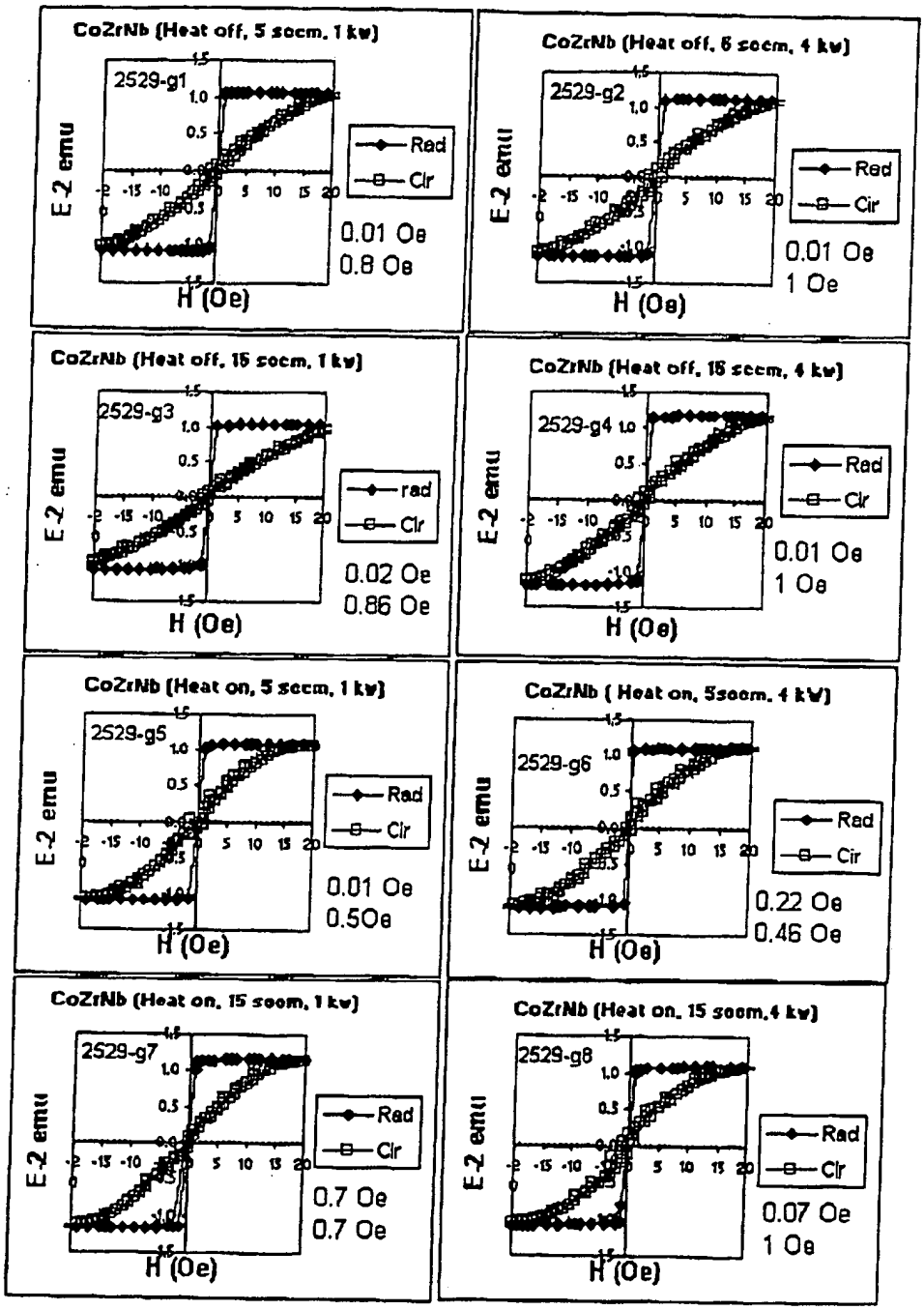

Figure 2. Hysteresis loops of 200 nm thick $Co_{91}Zr_5Nb_4$ soft underlayer films sputtered under various conditions in the presence of magnetron field on a substrate *without* a Co-Sm layer underneath the $Co_{91}Zr_5Nb_4$ soft underlayer films.